

CLAIMS

1. A microfluidic device, comprising:
a well plate comprising a plate and an array of wells formed on or in the plate; and
a microfluidic structure connecting at least two of the wells.
2. The device of claim 1, wherein the microfluidic structure is an H-Filter.
3. The device of claim 2, wherein the H-Filter includes at least two inlets and a microfluidic channel connected to the inlets.
4. The device of claim 3, wherein a first inlet is connected to a first well, and a second inlet is connected to a second well.
5. The device of claim 4, wherein the first inlet is configured to provide a first fluid from the first well to the microfluidic channel, and the second inlet is configured to provide a second fluid to the microfluidic channel in parallel with the first fluid.
6. The device of claim 2, wherein the H-Filter includes a microfluidic channel and at least two outlets connected to the channel.
7. The device of claim 6, wherein a first outlet is connected to a first well, and a second outlet is connected to a second well.
8. The device of claim 7, wherein the first outlet and the second outlet are configured to receive a portion of one or more fluids flowing from the microfluidic channel.

9. The device of claim 2, wherein the H-Filter includes at least one inlet, a microfluidic channel connected to the inlet, and at least one outlet connected to the channel.

10. The device of claim 9, wherein the at least one inlet is connected to a first well, and the at least one outlet is connected to a second well.

11. The device of claim 1, wherein one of the wells connected by the microfluidic structure has a bottom that is higher than the at least one other well.

12. The device of claim 1, wherein a pattern of the array of wells conforms to one of a 12-, 24-, 48-, 96-, 192-, 384-, or 1536-well plate format.

13. The device of claim 1, wherein the microfluidic structure connects at least four of the wells.

14. The device of claim 1, further comprising two or more microfluidic structures, each microfluidic structure connecting at least two of the wells.

15. A microfluidic device, comprising:
a well plate comprising an array of wells situated on or in the plate;
and

at least one microfluidic structure formed in, or in contact with the plate, each microfluidic structure being connected to the bottom of at least two of the wells.

16. The device of claim 15, wherein the array of wells conforms to one of a 12-, 24-, 48-, 96-, 192-, 384-, or 1536-well plate format.

17. The device of claim 15, wherein the at least one microfluidic structure includes at least two microfluidic structures.

18. The device of claim 15, wherein at least one microfluidic structure is an H-Filter.

19. The device of claim 15, wherein at least one microfluidic structure is a T-Sensor.

20. The device of claim 18, wherein the at least one microfluidic structure is connected to at least four wells.

21. The device of claim 19, wherein the at least one microfluidic structure is connected to at least three wells.

22. The device of claim 15, further comprising a microfluidic card that houses the at least one microfluidic structure, the card having a form and shape generally conforming to the form and shape of the well-plate.

23. The device of claim 22, wherein the microfluidic card is connected with the well plate by a hinge mechanism.

24. The device of claim 15, further comprising a pressure application mechanism, configured to apply a pressure to the wells.

25. The device of claim 24, wherein the pressure application mechanism includes a membrane configured to be overlaid on the well plate.

26. The device of claim 24, wherein the pressure application mechanism further includes a plurality of fingers, each finger controlling displacement of a fluid within a selected well by a portion of the membrane.

27. A system for performing a microfluidic process, comprising:
a well plate comprising an array of wells formed on or in the first plate; and

a microfluidic card comprising an array of microfluidic circuits, each circuit having at least one port hole, the card being sized and adapted for contact with the well plate such that the at least one port hole of each circuit is connected to at least one well.

28. The system of claim 27, wherein each well has a volume that is partially defined by a bottom.

29. The system of claim 28, wherein at least one well in the array has a larger volume than at least one other well.

30. The system of claim 28, wherein at least one well in the array has a lower bottom than at least one other well.

31. The system of claim 28, wherein the at least one port hole of each microfluidic circuit is connected to the bottom of a well.

32. A microfluidic device, comprising:

a plate having an array of wells formed on or in the plate, and a plurality of microfluidic structures, each microfluidic structure connecting at least two wells; and

a plurality of microfluidic channels, each channel provided within the connection between each group of said at least two wells, and being adapted for receiving a plurality of fluid streams that flow in parallel.

33. The device of claim 32, wherein the fluids flow one on top of another within each channel.

34. The device of claim 32, wherein each microfluidic channel is linear.

35. The device of claim 32, wherein each microfluidic channel is curved.

36. A method of performing a microfluidic process, comprising:

providing a plurality of fluid samples to a well plate, the well plate having an array of wells formed in or on the well plate;

transferring the fluid samples from each well into a corresponding microfluidic structure, wherein each microfluidic structure connects at least two wells; and

combining, in a channel within the microfluidic structure, at least two fluid samples in a parallel flow.

37. The method of claim 36, further comprising transferring the combined fluid samples from each microfluidic structure to at least one other well.

38. The method of claim 37, wherein the at least one other well is provided in a separate well plate.